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A Research Note

Meat Palatability of Duroc and Chinese First-Cross Barrows

T.L. WHEELER and L.D. YOUNG

ABSTRACT

Duroc, Meishan, Fengjing and Minzhu boars were mated to White composite gilts. Trained sensory panel evaluation and Warner-Bratzler shear force determinations were made on chops that had been aged 4 days postmortem. No differences ($P > 0.05$) were found in juiciness, connective tissue amount, flavor intensity, tenderness or shear force values among sire breeds. No differences ($P > 0.05$) were detected in cooking losses, although meat from the Duroc-sired pigs cooked at a faster ($P < 0.05$) rate, but required longer cooking ($P < 0.05$) times than that from the other sire breeds. These data indicate the introduction of currently available Chinese genetics into the U.S. swine population would have little effect on the palatability of pork loin chops.

Key Words: Duroc pork, Chinese pork, flavor, texture, shear force

INTRODUCTION

CERTAIN BREEDS of Chinese swine have been shown to be very prolific (Cheng, 1983; Zhang et al., 1983, 1986; Wang, 1988). These Chinese breeds have been imported into the United States to determine their potential contribution to swine production, and to determine the biological basis for their reproductive advantage. It also has been reported that meat palatability from Chinese swine is superior to that of some other breeds (Touraille et al., 1989; Suzuki et al., 1990). The potential use of the Chinese swine in United States swine production requires characterization of the influence of Chinese heritage on pork palatability. The objective of our research was to compare the meat palatability of first-cross Chinese-sired pigs with Duroc-sired pigs.

MATERIALS & METHODS

Animals

Forty-eight barrows from each of four genotypes (one-half Duroc, Meishan, Fengjing and Minzhu) were compared. Purebred boars of each genotype were mated with gilts from the advanced generations of a composite population developed from a crossbred foundation with equal genetic contributions from Chester White, Landrace, Large White and Yorkshire breeds. Duroc, Meishan, Fengjing and Minzhu breeds were represented by 7, 8, 8 and 6 boars, respectively. Pigs were weaned at 28 days of age and moved to a nursery pen. Littermates were penned together and moved to the finishing barn at about 63 days of age. Additional information regarding the origin and management of the Chinese pigs was reported by Young (1992a). The finishing diet met all nutrient requirements and contained 15.5% CP and 75.9% TDN (76.5% corn, 19.6% soybean meal, 2.4% dicalcium phosphate and 0.5% limestone). Pigs were slaughtered conventionally at the Roman L. Hruska U.S. Meat Animal Research Center at 7 day-of-age intervals from 168 to 203 days of age. Pigs were slaughtered at 7 day intervals to provide a range of slaughter weights and slaughter ages, since differences in weight between sire breeds were present at normal slaughter age. This allowed us to adjust data to constant age or constant weight without biasing the data from any one sire breed. Pens containing littermates were randomly assigned to slaughter dates. The data were adjusted to a constant 184-day slaughter age. Mean slaughter weights were 115.4 kg (Duroc), 112.2 kg (Meishan), 111.8 kg (Fengjing), 105.2 kg (Minzhu).

The authors are with the USDA, ARS, Roman L. Hruska U.S. Meat Anim. Res. Center, P.O. Box 166, Clay Center, NE 68933.

Sampling

The longissimus muscle from the 10th thoracic to the 3rd lumbar vertebrae was removed from one side of each carcass at 1 day postmortem and cut into 2.54-cm thick chops. The chops were vacuum packaged, aged at 2°C and then frozen at −20°C at 4 days postmortem. The chops were stored at −20°C for 12 to 16 wk. Frozen loin chops were thawed at 3°C for 24 hr prior to cooking. The loin chops were broiled on Farberware Open Hearth Electric broilers (model 450N) to 75°C internal temperature. The chops were turned after reaching 40°C. Temperature was monitored with iron constantan thermocouple wires inserted into the geometric center of a chop and attached to a Honeywell potentiometer multipoint recorder (model 112). Cooked chops for Warner-Bratzler shear force were chilled 24 hr at 3°C, then six, 1.27 cm diameter cores were removed parallel to the muscle fiber orientation and sheared once each on an Instron model 1132/Microcon II with a Warner-Bratzler shear attachment. The crosshead speed was 5 cm/min. Cooked chops for trained sensory panel analysis were cut into 1.3 × 1.3 × 2 cm samples (cooked surface was not removed) and served warm to a seven-member sensory panel trained according to American Meat Science Association (1978). Each panelist independently evaluated each sample for juiciness, tenderness, flavor intensity and connective tissue amount on 8-point scales (1 = extremely dry, tough, bland and abundant; 8 = extremely juicy, tender, intense and no connective tissue, respectively). Off-flavor was evaluated on a 4-point scale (1 = none; 4 = intense).

Statistical analysis

Data were analyzed using least squares mixed-model procedures (Harvey, 1985). The model included the main effects of breed of sire and sire within breed of sire. Slaughter age was included as a continuous variable and interacted with breed of sire to adjust the data to a constant 184-day slaughter age. Sire within breed of sire was considered to be random and breed of sire was considered to be fixed. Breed of sire effects were tested using the sire within breed of sire effect as the error term. Because sire within breed of sire was a random effect, levels of significance of breed of sire effects are considered approximations. All possible linear contrasts were made among breed of sire means adjusted to 184 days of age if the F-test for breed of sire was significant at $P < 0.05$.

RESULTS & DISCUSSION

A COMPARISON of Chinese and Duroc swine breeds for productivity (Young, 1992a) and carcass traits (Young, 1992b) has been reported. The effect of age was significant ($P < 0.05$) for connective tissue amount, tenderness, off-flavor and cooking rate. The interaction of sire breed and age was significant for cooking rate; however, the individual within line regression coefficients indicated the interaction was of little biological significance. There were no differences ($P > 0.05$) between sire breeds for any of the sensory traits measured (Table 1). Pork from all sire breeds was "slightly dry," "slightly intense" in flavor, had a "slight" amount of connective tissue, was "slightly tender" and had 3.4 to 3.9 kg shear force values. These data were in agreement with the trained sensory panel findings of Ellis et al. (1990). However, they reported that

Table 1—Effects of sire breed on Warner-Bratzler shear force and sensory and cooking traits

Trait	Duroc	Meishan	Fengjing	Minzhu	Pooled SE	Probability	
						Sire breed	Sire
Juiciness[a]	4.8	4.7	4.8	4.9	0.1	0.41	0.68
Connective tissue amount[a]	5.0	5.1	5.2	5.0	0.1	0.47	0.18
Flavor intensity[a]	5.0	4.9	4.9	4.9	0.1	0.32	0.00
Off-flavor[b]	3.1	3.0	3.0	3.0	0.0	0.39	0.01
Tenderness[a]	5.2	5.2	5.4	5.2	0.1	0.46	0.02
Shear force, kg	3.40	3.92	3.53	3.86	0.19	0.15	0.00
Cooking loss, %	36.5	35.8	35.3	34.6	0.5	0.05	0.28

[a] 1 = extremely dry, abundant, bland and tough; 8 = extremely juicy, none, intense and tender.
[b] 1 = intense, 4 = none.

pork from purebred Meishan pigs had lower shear force values compared to purebred Large Whites or their reciprocal F_1 crosses. Yen et al. (1991) reported no difference in palatability or cooking traits between 1/2 Meishan and 1/2 Duroc pigs. However, they reported that meat from full Meishan barrows was more juicy and tender, but not different in shear force, than that from 1/2 Duroc barrows, although the magnitude of the sensory tenderness difference indicated it was of little practical importance. Legault et al. (1985) reported that 1/4 Meishan, Jiaxing or Jinhua pigs produced meat with a similar meat quality index as the European control breeds (although components of the index were not described). In contrast to those studies, others have reported advantages in meat quality for the Chinese pigs. Touraille et al. (1989) reported that meat from Meishan pigs crossed with either Pietrain or Large Whites was more tender, juicy and flavorful than meat from the purebred Pietrain and Large Whites when tested by trained and consumer panels. A consumer panel found that Meishan and Ming (Minzhu) pigs produced meat that was higher in overall quality (including appearance, odor, taste, tenderness and texture) than was meat from Landrace × Duroc crossbred pigs (Suzuki et al., 1990). Discrepancies between published data and that reported here may be attributed to differences in breeds used as controls and different cooking methods.

No differences ($P > 0.05$) were found in percentage cooking loss between sire breeds (Table 1). Ellis et al. (1990) reported greater cooking loss for meat from the Large White breed with the F_1 crosses intermediate and the Meishan lowest in percentage cooking loss. These differences may be related to oven-baking (Ellis et al., 1990) as compared to broiling, which we used. Based on these results, we conclude that the introduction of currently available Chinese genetics into the United States swine population would have little effect on the palatability of pork loin chops.

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Names are necessary to report factually on available data; however, the USDA neither guarantees nor warrants the standard of the product, and the use of the name by USDA implies no approval of the product to the exclusion of others that may also be suitable.